Measurements.	M.
Length of true molars on base	.018
Diameters M. ii { anteroposterior	.006
Diameters M. ii { transverse	.0044
Diameters M. iii { anteroposterior	.0065
Diameters M. iii { transverse	.0038
Diameters P-m. iii { vertical	.0045
Diameters P-m. iii { anteroposterior	.004
Width of inferior face of symphysis	.008
Depth ramus at P-m. iii	.009
" " " M. iii	.0103

This species was obtained by Mr. D. Baldwin from beds of probably lowest Wasatch age, in New Mexico.

On the Systematic Relations of the Carnivora Fissipedia. By E. D. Cope.

(*Read before the American Philosophical Society, October 20, 1882.*)

This order embraces the clawed mammalia with transverse glenoid cavity of the squamosal bone, confluent scaphoid and lunar bones of the carpus, and well developed cerebral hemispheres. It is well distinguished from all others at present known, but such definition is likely to be invalidated by future discovery. Some of the Insectivora possess a united scapholunar bone, but the reduction of the cerebral hemispheres of such forms distinguishes them. The presence of the crucial fissure of the hemispheres is present under various modifications in all *Carnivora*, while the parietooccipital and calcarine fissures are absent.

The many types of existing carnivora fall into natural groups, which are of the grade termed family in zoölogy. But the distinction of these from each other is not easily accompanished, nor is it easy to express their relations in a satisfactory manner. The primary suborders of pinnipedia and fissipedia are easily defined. Various characters have been considered in ascertaining the taxonomy of the more numerous fissiped division. The characters of the teeth, especially the sectorials, are important, as is also the number of the digits. Turner* has added important characters derived from the foramina at the base of the skull, and the otic bulla, which Flower† has extended. Garrod‡ has pointed out the significance of the number of convolutions of the middle and posterior part of the hemispheres. I have added some characters derived from the foramina of the posterior and lateral walls of the skull.§ Mr. Turner also defines the families by the form and relations of the paroccipital process.

* Proceedings Zoological Soc., London, 1848, p. 63.
† Loc. cit., 1869, p. 5. ‡ Loc. cit., 1878, p. 377.
§ Proceedings Amer. Philosophical Society, 1880, p.

In studying the extinct carnivora of the Tertiary period, it has become necessary to examine into the above definitions, in order to determine the affinities of the numerous genera which have been discovered. To take them up in order, I begin with the foramina at the base of the skull. The result of my study of these has been, that their importance was not overrated by Mr. Turner, and that the divisions of secondary rank indicated by them are well founded. Secondly, as to the form and structure of the auditory bulla. Although the degree and form of inflation are characteristic of various groups of Carnivora, they cannot be used in a systematic sense, because like all characters of proportion merely, there is no way of expressing them in a tangible form. For, if the forms in question pass into each other, the gradations are *insensible*, and not sensible, as is the case with an organ composed of distinct parts. The same objection does not apply so much to the arrangement of the septa of the bulla. The septum is absent in the Arctoidea of Flower (*Ursidæ* of Turner), small in the Cynoidea (Flower, *Canidæ* Turner), and generally large in the Æluroidea (Flower, *Felidæ* Turner). But here occurs the serious discrepancy, that in the Hyænidæ, otherwise so nearly allied to the Felidæ, the septum of the bulla is wanting. Nevertheless, the serial arrangement of the order indicated by Flower, viz.: commencing with the Arctoidea, following with the Cynoidea, and ending with the Æluroidea, is generally sustained by the structure of the auditory bulla, and by the characters of the feet and dentition, as well as of the cranial foramina. Turner's arrangement in the order, Ursidæ, Felidæ and Canidæ, is not sustained by his own characters, and its only support is derived from Flower's observations on the external or sylvian convolution of the hemisphere of the brain.* There are three simple longitudinal convolutions in the raccoons; in the civets and cats the inferior convolution is fissured at the extremities, while in the dogs it is entirely divided, so that there are four longitudinal convolutions between the sylvian and median fissures.

An important set of characters hitherto overlooked, confirms Flower's order. I refer to those derived from the turbinal bones. In the ursine and canine forms generally, the maxilloturbinal is largely developed, and excludes the two ethmoturbinals from the anterior nareal opening. In the Feline group, as arranged by Turner, the inferior ethmoturbinal is developed at the expense of the maxilloturbinal, and occupies a part of the anterior nareal opening. These modifications are not, so far as my experience has gone, subject to the exceptions seen in the development of the otic septa and molar teeth, while they coincide with their indications. The seals possess the character of the inferior group, or Ursidæ, in a high degree.

The characters derived from the paroccipital process are of limited application, as the study of the extinct forms shows.

* Proceedings Zoological Society, London, 1869, p. 482.

I would then divide the fissiped carnivora into two tribes as follows:

External nostril occupied by the complex maxilloturbinal bone; ethmoturbinals confined to the posterior part of the nasal fossa; the inferior ethmoturbinal of reduced size.....HYPOMYCTERI.
External nostril occupied by the inferior ethmoturbinal and the reduced maxilloturbinal.....EPIMYCTERI.

While no doubt transitional forms will be discovered, the types at present known fall very distinctly into one or the other of these divisions. The characters are readily preceived on looking into the nares of well cleaned specimens. The *Hypomycteri* stand next to the *Pinnipedia*, since the maxilloturbinal bone has the same anterior development in that group.

In searching for definitions of the families, it is necessary to be precise as to the definition of terms. The meaning of the word sectorial is in this connection important, sinee there are so many transitional forms between the sectorial and tubercular tooth. A sectorial tooth then of the upper jaw, is one which has at least two external tubercles, which are the the homologues of the median and posterior lobes of the sectorial of the cat. By the flattening and emargination of their continuous edges, the sectorial blade is formed. One or two interior, and an anterior lobe, may or may not exist. In the genera of the *Procyonidæ*, except in *Bassaris*, the two external tubercles do not form a blade. The inferior sectorial tooth differs from the tubercular only in having an anterior lobe or cusp, which belongs primitively to the interior side. The inferior sectorial teeth with large heels, as in Viverridæ and Canidæ, I have called tubercular-sectorials. The sectorial blade is formed by the union and emargination of the edges of the anterior and the principal external cusp. This blade is not well developed in the genus *Cynogale* and still less in the *Procyonidæ* and *Ursidæ*. The families are then defined as follows.

HYPOMYCTERI.

I. No sectorial teeth in either jaw.

Toes 5–5.....*Cercoleptidæ*.

II. Sectorial teeth in both jaws.

a. Toes 5–5

β. No alisphenoid canal.

True molars $\frac{2}{2}$.....*Procyonidæ*.
" " $\frac{1}{2}$.....*Mustelidæ*.

ββ. An alisphenoid canal.

Molars quadrate, $\frac{2}{2}$.....*Aeluridæ*.
Molars longitudinal, $\frac{3}{3}$.....*Ursidæ*.

aa. Toes 5–4 or 4–4.

Sectorials well developed, an alisphenoid canal.....*Canidæ*.

EPIMYCTERI.

I. Molars haplodont.

Toes 5–4; no alisphenoid canal..... .....*Protelidæ.*

II. Molars bunodont, no sectorials.

Toes 5–5; an alisphenoid canal.....*Arctictidæ.*

III. Molars bunodont, with sectorials.

a. Otic bulla with septum.

β. Alisphenoid canal and postglenoid foramen, present.

γ. True molars well developed.

Toes 5–5..... .....*Viverridæ.*
Toes 5–4.....*Cynictidæ.*
Toes 4–4.....*Suricatidæ.*

γγ. True molars much reduced.

Toes 5–5..... .....*Cryptoproctidæ.*
Toes 5–4.....*Nimravidæ.*

ββ. No alisphenoid canal; post glenoid foramen rudimental or wanting.

Toes 5–4..... .....*Felidæ.*

αα Otic bulla without septum.

No alisphenoid canal, nor post glenoid foramen: Toes 4–4.....*Hyænidæ.*

The genera of these families are the following:

CERCOLEPTIDÆ; *Cercoleptes* Neotropical.

PROCYONIDÆ; *Procyon,* Bassaricyon, Bassaris;* Nearctic and Neotropical.

MUSTELIDÆ; Melinæ (two tubercles of internal side of superior sectorial); *Taxidea, Meles.* Mustelinæ, (one internal tubercle of superior sectorials); *Enhydris, Pteronura, Lutra, Aonyx, Barangia; Helictis, Zorilla, Mephitis, Conepatus; Mellivora; Gulo, Galictis, Putorius, Mustela.*

ÆLURIDÆ; *Aelurus; Æluropoda ? Hyænarctos.*

URSIDÆ; *Helarctos; Arctotherium; Ursus; Melursus.*

CANIDÆ; *Megalotis*† *; Amphicyon; Thous, Palæocyon, Temnocyon, Galecynus, Canis, Vulpes, Enhydrocyon, Hyænocyon, Brachycyon, Tomarctus, Speothus, Synagodus, Dysodus, Oligobunis, Icticyon, Lycaon.*

PROTELIDÆ; *Proteles.* Ethiopian.

ARCTICTIDÆ; *Arctictis.* Indian.

VIVERRIDÆ; *Cynogale, Arctogale, Paguma, Paradoxurus, Nandinia, Hemigale, Galidia, Prionodon, Genetta, Viverricula, Viverra, Galidictis, Herpestes, Athylax, Calogale, Ichneumia, Bdeogale, Urva, Tæniogale, Onychogale, Helogale, Rhinogale, Mungos, Crossarchus, Eupleres.*

CYNICTIDÆ; *Cynictis, ? Ictitherium.*

SURICATIDÆ; *Suricata;* Ethiopia.

CRYPTOPROCTIDÆ; *Prœlurus; Cryptoprocta.*

NIMRAVIDÆ; *Archælurus, Nimravus, Ælurogale; Dinictis, Pogonodon, Hoplophoneus.*

* Including *Nasua*, which is not distinct.

† This genus cannot be made the type of a family as is done by Dr. Gray.

FELIDÆ; Machærodontinæ; *Machærodus, Smilodon;* Felinæ; *Plethælurus* (g. n.)*, *Catolynx; Felis; Neofelis; Uncia,*† *Lynx, Cynælurus.*
HYÆNIDÆ, *Hyænictis, Hyæna, Crocuta.*

Stated Meeting, Oct. 6th, 1882.

Present, 12 members.

Dr. CRESSON in the Chair.

Letters of acknowledgment were received from the Royal Society, Tasmania (90, 91), and the Surgeon General's Office, Washington (110, 111).

Letters of envoy were received from the Meteorological Office, London; and the University Library, Cambridge, England.

A request for missing numbers in the set of the American Philosophical Society Transactions and Proceedings in the library of the Geological Survey of Canada, was referred to the Librarian to report at the next meeting.

Donations for the Library were received from the Academies at St. Petersburg, Amsterdam, Turin, and Rome; Swedish Bureau of Statistics; Christiania University; Royal Danish Society; Royal Observatory, Turin; Zoologischer Anzeiger, Leipsig; Revue Politique, Paris; Meteorological Council, and Nature, London; Geological Society, Glasgow; M. Douw Lightfall, Montreal; Natural History Society, Boston; American Antiquarian Society, Worcester; American Philological Association; Free Public Library, New Bedford; American Journal, New Haven; N. Y. Meteorological Observatory; Buffalo Society of Natural Sciences; E. M. Museum of Geology and Archæology, Princeton; Franklin Institute, College of Pharmacy, Pennsylvania Museum of Industrial Art, and E. A.

* Type, *Felis planiceps* vig. Horsf. Char. Second (first) superior premolar two rooted; orbit closed behind; pupil round.

† Mr. Wortman has called my attention to a character of this genus which confirms its separation from Felis, as I proposed in 1879. The maxilloturbinal bone is less complex in the genus Uncia, than in Felis, consistently with a less nocturnal habit, and less necessity for acute smell.